point in mind, and with a negative result. In response to a query from Professor Doolittle as to the precision of the observations Professor Pickering stated from recollection that the error of a single observation might be three or four seconds, but that the hundreds of observations available brought the probable error well within the precision required.

It seems to me there is room for an honest difference of opinion as to the value of the method of least squares in a case like this, where the error of a single observation may be forty-five or more times as great as the quantity to be detected. Surely we must draw a line somewhere.

While I have given this point no extended investigation, I may formulate my own opinion, as a basis for discussion, in the form of a mathematical theorem:

The value of the measure of precision obtained by applying the method of least squares varies inversely as the ratio e/q (where $e =$ error of a single observation and $q =$ quantity to be measured), in such a manner that when $e/q = 1$ the value is zero, and for $e/q > 1$ the value is wholly imaginary.

PAUL R. HEYL

DR. BRUSH'S THEORY OF GRAVITATION

TO THE EDITOR OF SCIENCE: The article by Dr. Brush on "A Kinetic Theory of Gravitation" in SCIENCE of March 10, will become of great interest to physicists when the author does what he partly promises to do in a future paper, viz., explains how a body which is perfectly transparent to a given radiation can shield another body from that radiation, and why, if the other body is also perfectly transparent, it makes any difference whether it is shielded from the radiation or not. It would appear to be immaterial, so far as the effect upon the body is concerned, whether the atoms of a body through which this radiation is streaming in all directions are "buffeted about in every direction by the ether waves in which they are entangled" or whether they remain undisturbed by these waves, so long as they do not absorb any energy from the radiation.

Dr. Brush says that in the former case, "Each atom or molecule may be regarded as a center of activity due to its kinetic energy of translation, with continual absorption and restitution of the ether's energy normally equal in amount." This seems to the present writer equivalent to saying that a perfectly transparent body may be regarded as one in which the atoms are continually absorbing and radiating equal quantities of the same kind of energy. If anything can be gained by making such an assumption, there seems to be no objection to making it, and I, for one, shall look forward with interest to Dr. Brush's explanation of how it will enable such a transparent body to cast a shadow.

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SCIENTIFIC BOOKS

Soil Fertility and Permanent Agriculture. By CYRIL G. HOPKINS, University of Illinois. Pp. xxiii + 653; 14 illustrations, 3 colored maps. Boston, New York and London, Ginn & Co. Price $2.50.

Of this work the author says: "The chief purpose of this volume is to bring together in convenient form the world's most essential facts, gathered from the field and laboratory, and to develop from them some foundation principles of permanent agriculture." The book is a notable contribution to the foundations of practical agriculture, treated in an introduction and four parts, I., Science and Soil; II., Systems of Permanent Agriculture; III., Soil Investigations by Culture Experiments; IV., Various Fertility Factors.

The method of treatment adopted is admirable but not that usually chosen by writers on either soil or agricultural chemistry. The book takes a distinct place in agricultural literature and will be found a mine of information and valuable reference to the subjects it treats. Professor Hopkins holds persistently throughout the volume to the thesis named in the title and does not aim to treat in detail a wide range of topics, but has built his treatment upon a broad, most substantial